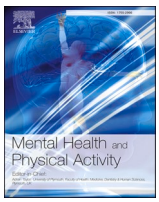
Mental Health and Physical Activity 19 (2020) 100355

Contents lists available at ScienceDirect

Mental Health and Physical Activity

journal homepage: www.elsevier.com/locate/menpa



Qualitative systematic review of the acceptability, feasibility, barriers, facilitators and perceived utility of using physical activity in the reduction of and abstinence from alcohol and other drug use

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ARTICLE INFO

Keywords:
Physical activity
Alcohol
Substance use
Barriers and facilitators
Mechanisms

ABSTRACT

Given the growing global increase in harm from alcohol and substance use, and the inadequacy of standard treatment to tackle the challenge, the use of physical activity (PA) interventions has received increased attention. The aim of this review is to identify common and cross cutting themes relating to how and why physical activity may impact on reduction of/abstinence from alcohol and other drug use to support future intervention design (including aspects of physical activity, barriers and facilitators, and elements of support which may have an impact). Twenty papers including qualitative data were included in the synthesis. A deductive coding framework was created and sought to identify biological, environmental and psycho-social barriers, facilitators and mechanisms of participants' experience of engaging with physical activity interventions. Key themes supported in the evidence included how interventions influence use (e.g. reduced cravings, increases in bodily awareness and health and fitness, the development of positive focus and new identity, and increases in mood and quality of life); the impact of frequency, intensity, type, duration and timing of physical activity; perceived barriers and facilitators to engaging in physical activity (e.g. health and fitness, access and affordability, perceptions of others); and details of how much support and in what form best supports sustained changes in physical activity (e.g. social support and environment). Despite evidence being sparse, key barriers and facilitators pertinent to intervention design were identified. Recommendations for future research are indicated and the evidence promotes the need for individually tailored programmes of support for physical activity.

1. Background

Problems associated with alcohol and other drug (AOD) use are common. Worldwide, 5.9% and 1% of deaths are associated with alcohol and illicit drug use, respectively (World Health Organisation, 2014). In the UK alcohol related harm is estimated to cost in the area of £21 billion (£3.5bn in healthcare (Public Health England, 2013). Almost 1 in 10 adults between the ages of 16–59 are reported as having used illicit drugs in the past year within England and Wales (Public Health England, 2014), resulting in an economic cost of approximately £15 billion (The Centre for Social Justice, 2013) (£488 million through healthcare costs alone (The National Treatment Agency for Substance Misuse, 2012)).

The notion of 'recovery' from substance use disorders (SUD) traditionally centres on abstaining from or controlling consumption. However, recent dialogue has argued that this should be extended to encompass the wider aspects of people's lives to include wellbeing,

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https://doi.org/10.1016/j.mhpa.2020.100355
Received 4 February 2020; Received in revised form 13 August 2020; Accepted 18 August 2020
Available online 26 August 2020

relationships and environmental factors (Best, 2017; Kelly, 2017; Lancaster, 2017; McKay, 2017; Robertson & Nesvåg, 2019). The transition from 'substance-user' to 'non-user' can be highly challenging and involve fundamental shifts in social relationships, daily routines/activities, housing and finances. The acute treatment phase provides some experience of leading a life without substance use and of starting to build a substance free identity; leaving treatment can make maintaining these challenging (Robertson & Nesvåg, 2019). Successful long-term recovery needs to involve experiences that are enjoyable and rewarding within a wider environment of new activities, behaviours and support (McKay, 2017).

Challenges exist in conceptualising and measuring what outcomes represent recovery, not least because of the disparity between and within clients' and practitioners' understanding of what recovery constitutes (Neale et al., 2015). People who use substances are able to reflect on their experiences and are well positioned to guide policy and practice about what has worked for them, and at what stage in their recovery. Mechanisms for change and the barriers/facilitators within this may vary according to whether individuals are in the initial stages of abstinence or sustained recovery. Additionally, individual variation in terms of socio-demographics, personal preference and recovery capital also influence how people might be best supported to maintain recovery (Kelly, 2017).

Evidence suggests that a secure, sustained recovery is grounded in meaningful activities and social relationships based within the community (Best, 2017; Best, Gow, Taylor, Knox, & White, 2011; McKay, 2017; Robertson & Nesvåg, 2019), and interventions based around physical activity (PA) may offer a valuable contribution.

It has been hypothesised that physical activity may affect AOD use through various psychological mechanisms, such as reduced craving and/or improved mental health (Linke & Ussher, 2015; Taylor & Thompson, 2018) and enhancements in self-regulation (Oaten & Cheng, 2006). In terms of behaviours, PA may help in the avoidance of situations that instigate cravings, whilst also providing alternative environments and rewarding experiences (Linke & Ussher, 2015). PA also provides a vehicle for involvement in structured and meaningful activities, which is theorised as a key component to overcoming problems with alcohol and other drugs (S. A. Landale, 2012).

Recent studies indicate that physical activity interventions can be acceptable for those with substance use disorders (Abrantes et al., 2011; Neale, Nettleton, & Pickering, 2012; Stoutenberg, Warne, Vidot, Jimenez, & Read, 2015; Weinstock, Farney, Elrod, Henderson, & Weiss, 2017), but no review exists of this literature to help inform the design of the most feasible and acceptable interventions across levels of use (i.e. non-dependent and dependent).

Despite evidence that PA can offer an adjunct to traditional treatments, there is limited knowledge about how it influences AOD use. This review has been conducted in parallel with a systematic review of quantitative evidence (Thompson et al., under review)to further understanding of both if and how PA can be used in the reduction of and abstinence from alcohol and other drug use. The quantitative paper aims to examine impact and variation in study design. Conducting this qualitative review will aid with understanding the experiences of physical activity amongst people who use alcohol or other drugs, and is vital to developing knowledge of how best to design interventions that engage and sustain participation in PA. Qualitative research offers the best approach to understanding these issues (mechanisms and processes which cannot easily be measured through quantitative means), and in this paper we synthesise findings from qualitative studies to illustrate how this might best be achieved and inform our understanding of where gaps remain.

2. Aim

To systematically identify and review qualitative research which may aid the understanding of how engagement with physical activity (defined as any bodily movement that requires energy expenditure, inclusive of organised sport and exercise (World Health Organisation, 2017)) can support the reduction and abstinence from alcohol and other drug use and inform future support systems.

3. Review questions

1. In what way(s) do PA interventions appear to influence AOD use?
2. In what way(s) does the frequency, intensity, duration, type and timing of PA impact AOD use?
3. What are the reported barriers and facilitators to taking part in PA amongst individuals with AOD/SUD?
4. How much support and in what mode of delivery best sustains an increase in PA in order to limit AOD use?

4. Methods

This paper forms part of a larger systematic review on physical activity and the prevention, reduction, and treatment of alcohol and/or substance use across the lifespan (The PHASE review; PROSPERO registration number CRD42017079322). A detailed explanation of the wider methods including detailed search strategy and key words can be found in the published protocol (Thompson et al., 2018).

4.1. Inclusion and exclusion criteria

Studies were not limited by country but were limited to papers published in English. To reflect the comprehensive nature of the review, no limit was placed on the population being studied, the setting in which the study took place, nor the type of physical activity. The focus had to be on physical activity and its possible impact on AOD use (excluding tobacco), including barriers and facilitators, issues of acceptability and feasibility, perceived utility of PA, and implementation issues. Studies had to have a distinguishable PA component, or form the majority of the intervention, to be included to avoid confounding from other indistinguishable components. Any study using a recognised qualitative methodology was considered, including mixed methods papers with a qualitative component.

4.2. Search strategy

A highly sensitive search strategy of published and grey literature was developed using background scoping searches, previously identified relevant research, and consultation with subject experts and public and patient involvement. The search was originally conducted on June 2nd, 2017, with an updated search on March 1st, 2018. The strategy included searches of the following sources: MEDLINE (Ovid); MEDLINE (PubMed); Embase (Ovid); PsychINFO (Ovid); Cochrane Library (Wiley); International Bibliography of the Social Sciences (ProQuest); Web of Science Core Collection; CINAHL (EBSCO); AMED (EBSCO); Social Policy and Practice (Ovid); and Applied Social Sciences Index and Abstracts (ProQuest). Supplementary searching was conducted with the following databases: PsychEXTRA; Google Scholar; Open Grey; ProQues; Dissertations & Theses; British Library EThOS; Scottish Addiction Studies online library; HRB National Drugs Library; NIDA International Drug Abuse Research Abstract Database; Tufts CEA Registry; Database of promoting health effectiveness reviews (DoPHER); and NHS Evidence (NICE).

4.3. Study selection

Title and abstract screening was independently completed by two reviewers (JH, TT). Discrepancies were discussed and if necessary referred to a third independent reviewer (AHT) until consensus was achieved.

4.4. Quality appraisal

Qualitative studies were independently assessed by two reviewers (JH, TT) for methodological rigour, credibility, and relevance using a ten-item checklist developed and published by the Critical Skills Appraisal Programme (CASP (Critical Appraisal Skills Programme, 2017). Discrepancies were resolved through discussion, as recommended in the Centre for Reviews and Dissemination guidance for use in qualitative systematic reviews (Centre for Reviews and Dissemination, 2009). A scoring system was attributed to each item (Yes = 2, Can't tell/partial = 1, No = 0) so that each study could be attributed an overall score. . All studies were included independently of their score (see Table 1).

4.5. Data extraction and qualitative synthesis

Result sections of retrieved papers were exported in full into NVivo 11 (QSR International Pty Ltd.). Research questions were developed from the framework for understanding physical activity and mental health relationships model (Taylor & Faulkner, 2014) which was designed to help understand how behavioural support in different forms can influence behavior change processes, and how changed behavior can influence mental health through different mechanisms associated with different types and intensities of PA.

Coding was conducted by JH and independently verified by TT, at which point discrepancies were discussed and agreement reached. Data was analyzed using thematic analysis adopting Braun and Clarke's six-phase process of (i) data familiarisation; (ii) coding; (iii) generation of initial themes; (iv) reviewing themes; (v) defining and naming themes and (vi) writing up (Braun & Clarke, 2006). Analysis consisted of a hybrid approach of both deductive and inductive coding. A deductive coding framework was created based on the physical activity and mental health model (Adrian H. Taylor & Faulkner, 2014), and sought to identify biological, environmental and psycho-social barriers, facilitators and mechanisms of participants experience of engaging with interventions involving PA (quoted and as reported by the original authors). Inductive codes were developed under each category and applied to data to allow novel elements of the patient experience to emerge. Themes were then established and refined to identify links across barriers, facilitators and mechanisms. Researchers then met (JH, TT, AT) to best identify the development of analytical themes (Thomas & Harden, 2008) to synthesise findings across studies and apply them to the research questions. The raw data was then revisited to ensure all findings were substantiated.

5. Results

5.1. Identification of studies

Searches returned 46,172 titles after removal of duplicates. Two researchers (JH, TT) independently screened returns and 46,102 titles/abstracts were excluded based on inclusion/exclusion criteria (Fig. 1). 70 full texts were identified for full text screening and independently screened, resulting in 15 qualitative and 5 mixed methods papers being included in the review. These studies are summarised in Table 1. A search of the grey literature identified 5 relevant service evaluations but contained no data which could be extracted and analysed within this review. Of the 20 academic papers identified, 19 related to treatment (clinically diagnosed or seeking treatment for an AUD or SUD) or reduction (non-treatment seeking or not clinically diagnosed as having an AUD or SUD) in levels of use. Defining clear differentiation parameters between treatment and reduction studies was problematic due to both the nature of participants and intervention design, particularly as reduction can be an outcome for treatment in AUD but not necessarily in SUD where only abstinence represents a successful outcome. One qualitative paper was identified that investigated the influence of PA on prevention. However, whilst it met the inclusion criteria, no data were presented that could be included within the aims of this review.

Included studies were highly heterogeneous in terms of intervention design, populations and outcomes. Five studies (25%) were judged to be of low quality, seven (35%) medium and eight (40%) high quality (Critical Appraisal Skills Programme. (2017) (Table 1).

32 codes were originally identified which were then synthesised into 13 analytic themes as reported below. Quotations below are from original texts and italicised. Parentheses following quotes provide source reference.

5.2. In what way(s) do PA interventions appear to influence AOD use?

How PA influences and interacts with substance use is complex, multi-faceted and varies across individuals. Mechanisms appear to work across and between biological and psychosocial planes of influence and may alter depending on wider environmental and social contexts.

5.2.1. Reduced AOD use through a reduction in cravings and the avoidance of relapse

PA contributes to a reduced desire to use AOD, and/or the ability to delay/reduce consumption (Beynon et al., 2013; Gimenez-Meseguer et al., 2015; Hallgren et al., 2014; Landale & Roderick, 2013; Neale et al., 2012; Van Hout & Phelan, 2014) through a number of psychological mechanisms: the perception of the two behaviours as incompatible (Gimenez-Meseguer et al., 2015), distraction (Gimenez-Meseguer et al., 2015; Landale, 2012; Linke et al., 2019; Neale et al., 2012; Ussher et al., 2000), the facilitation of a healthier focus (Morton et al., 2016; Smoyer, 2016), and the provision of a replacement 'high' (Neale et al., 2012; Roessler, 2010; Van Hout & Phelan, 2014):

> *What I have is an impulsiveness and nervousness that drives me to a state of anger, of rage, and then I want to run away and consume. [Physical activity] helps you to keep your mind occupied, it takes bad thoughts away from you (…). Since I came here (exercise program), I haven't had any desire to consume. I remember some situations, some moments, but when I'm doing exercise, nothing at all* (Gimenez-Meseguer et al., 2015).

5.2.2. Reduced AOD use through increases in bodily awareness, health and fitness, and the setting of goals

Participants across studies spoke of improved bodily awareness and worries over ill health, weight and lack of fitness as motivators for increasing activity levels (Beynon et al., 2013; Gimenez-Meseguer et al., 2015; Neale et al., 2012; Nguyen et al., 2017; Roessler, 2010; Smoyer, 2016; Ussher et al., 2000; Van Hout & Phelan, 2014). Talk also centred on the experience of increased fitness, including endurance and strength (Beynon et al., 2013; Curran et al., 2016; Gimenez-Meseguer et al., 2015; S. A.; Landale, 2012; Linke et al., 2019; Muller & Clausen, 2015; Neale et al., 2012; Ussher et al., 2000). However, one study noted that participants were more concerned with movement and relaxation than physical conditioning (Smoyer, 2016).

Involvement in PA interventions also initiated the adoption of a wider range of healthier behaviours, such as the reduction or cessation of smoking (Beynon et al., 2013; Muller & Clausen, 2015; Neale et al., 2012; Ussher et al., 2000; Van Hout & Phelan, 2014), reductions in levels of prescribed medications (Nguyen et al., 2017; Roessler, 2010), becoming less sedentary (Muller & Clausen, 2015), improved sleep (Roessler, 2010; Van Hout & Phelan, 2014) and healthier eating (Beynon et al., 2013; Morton et al., 2016; Ussher et al., 2000; Van Hout & Phelan, 2014):

> *My body was absolutely fantastic, the fitness level was unbelievable. That was down to the sport and the running and the cycling. Probably eating a bit better, getting a better night sleep, not drinking and smoking. Everything. Me [my] body was coming back to its former glory, it was getting*

Table 1
Study characteristics.

Lead author (date)	Aims/focus, design, analysis	Type	Substance	Sample size	Demographics, country	Quality rating (CASP)
Abrantes et al. (2017)	To investigate the benefits of exercise for decreasing depression, negative affect, and urges to drink. Mixed methods Qualitative exit interview (quotes reported)	Treatment	Alcohol	N = 20	USA Adult women mean age 39.5yrs	low
Beynon et al. (2013)	To test whether older drug users (aged 40 and over) could be recruited to an exercise referral (ER) scheme, to evaluate the feasibility and acceptability and measure the impact of participation on health. Observational pilot	Treatment	Substance (not explicitly reported; opiates indicated)	N = 17 (participants) N = 7 (specialist gym instructors	UK. Male & female adults. Mean age 47.3 yrs	medium
Butzer, LoRusso, Shin, and Khalsa (2017)	7th grade students' subjective experience of a school-based yoga program, as well as students' perceptions of the potential effects of the program on psychosocial well-being (including substance use) Post-intervention qualitative interviews/Grounded theory approach (part of mixed methods RCT)	Prevention	Both (reports on alcohol, marijuana, and "other drugs")	N = 16	USA School students. Mean age 13.27yrs	high
Curran, Drust, Murphy, Pringle, and Richardson (2016)	To investigate the challenges that men from hard-to-reach (HTR) populations encounter when attempting to commit to regular participation in physical activity and health behaviours, and to explore the psychological and social effects of participation in a twelve week football-led health improvement intervention. Ethnographic and observational methodologies Deductive/inductive analysis	Treatment	Both (not specified)	N = 34	UK Men living in homeless shelters and/or recovering from substance misuse. Aged 18–45yrs	high
Gimenez-Meseguer, Tortosa-Martinez, and Remedios Fernandez-Valenciano (2015)	Mixed methods study to evaluate quality-of-life changes in drug-dependent patients after participation in a group-based exercise program. In-depth interview	Treatment	Substance (not specified)	N = 11 (qual only) 37 in full trial, mean age 37.69yrs	Spain Adults in an intensive drug treatment program	medium
Hallgren, Romberg, Bakshi, and Andréasson (2014)	To explore the feasibility of yoga as part of a treatment program for alcohol dependence. Mixed methods. Qual element: interviews	Treatment	Alcohol	N = 5 (qual only) 18 in full trial	Sweden. Adults in an alcohol treatment clinic	low
Landale (2012)	To investigate the contribution sporting programmes may make to people in their recovery from addiction. Biographical case studies/ qualitative interviews. Longitudinal study Life course theory of informal social controls	Treatment	Both (heroin, alcohol, stimulant, cannabis)	N = 49 (analysis of n = 19, but full cohort included in demographic data reported.	UK male & female adults average age 31yrs	high
S. Landale & Roderick, 2014	To describe the meaning participants attach to the programme in the context of their recovery and located in their day-to-day lives over 12 months Biographical case studies/ Longitudinal study Life course theory of informal social controls	Treatment	Both (polyuse, including alcohol, marijuana, and heroin)	N = 2	UK. Male adults aged 32 & 25yrs	medium
Linke et al. (2019)	Mixed methods pilot study to examine the feasibility and acceptability of a multi-	Treatment	Both (alcohol, marijuana, cocaine, methamphetamine)	N = 11	USA. Adults, mean age of 45yrs	Low

(*continued on next page*)

Table 1 (*continued*)

Lead author (date)	Aims/focus, design, analysis	Type	Substance	Sample size	Demographics, country	Quality rating (CASP)
	component exercise-based intervention for veterans seeking SUD treatment through an outpatient Alcohol & Drug Treatment Program					
Malloch (2011)	To examine the challenges inherent in setting up and sustaining a project that has a primary aim to "bring recovery into the community." Views and experiences of CARG members were obtained from attendance at two recovery meetings and from subsequent interviews with 11 men and the CARG director	Treatment	Both (not specified)	N = 11	Scotland. Males aged between 23 and 60yrs	medium
Morton, O'Reilly, and O'Brien (2016)	To explore the change processes for participants engaging in a 20-week integrated fitness and education substance-use rehabilitation program Focus groups/thematic analysis	Treatment	Both (alcohol, prescribed methadone, cannabis, heroin, codeine, benzodiazepine)	N = 17	Ireland. Male & female, age range 35–39yrs	high
Muller and Clausen (2015)	To measure changes in quality of life after group exercise among residential substance use disorder patients, and to explore the feasibility of the program within a treatment setting. Mixed methods. Qual aspect: Spontaneous feedback and answers to open ended questions	Treatment	Both (alcohol, benzodiazepine, cannabis, heroin, amphetamines)	N = 35	Norway Male & female, mean age 41yrs	low
Neale et al. (2012)	Exploration of individuals' self-reported participation in physical activity, sport and exercise; their desire to participate; and any barriers to participation experienced. Qualitative interviews/thematic analysis	Treatment	Substance (heroin)	N = 40	UK Adult heroin users. Age range 24–50yrs	high
Nguyen et al. (2017)	Experience of exercise for pain management among older HIV-infected adults with chronic pain and substance use Focus group/thematic analysis	Treatment	Both (alcohol and "illicit drug use" or "prescription drug use without a prescription"	N = 27	USA Males living with HIV and chronic pain. Mean age 54yrs	high
Peterson and Johnstone (1995)	To report the effectiveness of an experimental wellness program included as part of a residential treatment unit in a federal correctional institute. Qualitative self-report/thematic analysis	Treatment	Both (polysubstance use)	N = 43	USA Female offenders. Mean age 35yrs	low
Roessler (2010)	To explore a programme using exercise to alter the behaviour and body image of drug addicts. Qualitative semi-structured focus interviews (part of a mixed methods study)	Treatment	Substance (heroin, methadone, other opiates, opioid-analgesics, cocaine, amphetamines and cannabis)	N = 20	Denmark. Adults with an average age of 35yrs	medium
Sari, Muller, and Roessler (2017)	Experiences and reasons for dropping out from an exercise intervention in an outpatient treatment centre Semi-structured qualitative interviews/social cognitive theory	Treatment	Alcohol	N = 17	Denmark Adults aged between 30 and 68yrs	high
Smoyer (2016)	Describe and evaluate a trauma-informed yoga program for low-income women with substance use disorders. Intake survey and semi-structured evaluation interviews. Question analysis & semi-structured evaluation interviews post intervention	Treatment	Both (not specified)	N = 10	USA Adult women attending a community-based non-profit substance abuse program	medium
		Treatment	Alcohol	N = 5		medium

(*continued on next page*)

Table 1 (*continued*)

Lead author (date)	Aims/focus, design, analysis	Type	Substance	Sample size	Demographics, country	Quality rating (CASP)
Ussher, McCusker, Morrow, and Donaghy (2000)	People in recovery accessing community alcohol service to increase independent PA & engage in community activities Case studies using self-report inventories and ethnographic methods				UK Adults. Mean age 37.4 yrs	
Van Hout and Phelan (2014)	Social processes attached to involvement in fitness training and organized sports when engaging in young adult offender community reintegration supports. Case study/Grounded theory	Treatment	Both (alcohol, cannabis, ecstasy, heroin, cocaine, and benzodiazepines)	N = 9	Irish white males aged 21–27yrs	high

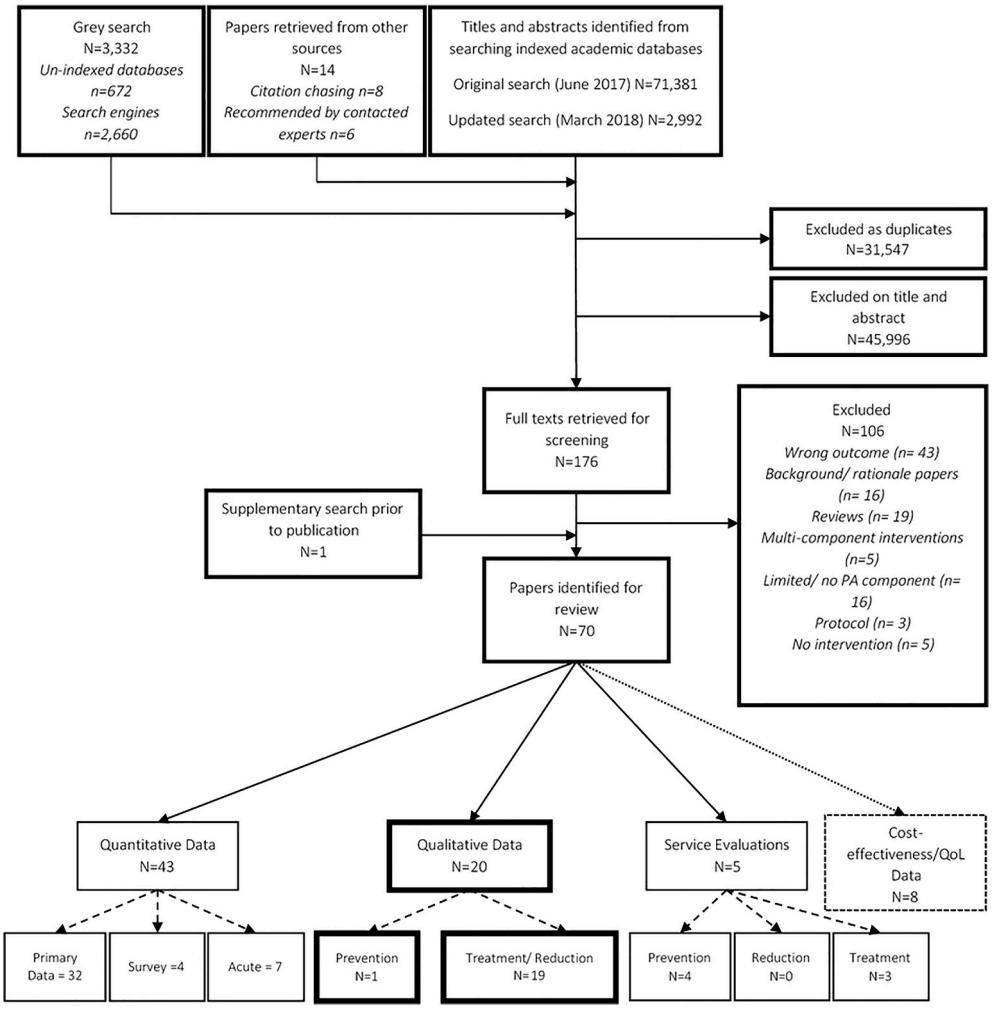

Fig. 1. Flow chart of study selection process.

places. I know fourteen weeks does not sound like much, but I stopped smoking and drinking and everything (Van Hout & Phelan, 2014).

5.2.3. Reduced AOD use through the development of a new positive focus and the formation of a new identity

The combination of stopping AOD use and increasing physical activity appears to facilitate a shift in focus toward building and maintaining alternative foci such as family, community and prioritising daily structure and wellbeing (Beynon et al., 2013; Curran et al., 2016; Gimenez-Meseguer et al., 2015; S. A.; Landale, 2012; S; Landale & Roderick, 2013; Morton et al., 2016; Neale et al., 2012; Smoyer, 2016; Ussher et al., 2000; Van Hout & Phelan, 2014). Many of the mechanisms discussed fed into the development of a new identity which, as it became reinforced and its value increased, amplified their desire to stop using alcohol or other drugs. A key component to the meaning attributed to this identity appears to be the recognition of staff, peers and family. In addition, many users spoke of needing to cease contact with old social

circles which carried with them the danger of relapse. In this case, establishing new friendships through PA offers an alternative to social isolation, which in turn reinforces the establishment of a new identity and their immersion into mainstream norms.

> *And like the ones from [area] I've been getting to know them … it's a good bunch of lads here. I like coming here, because I dinnit associate with anybody in [hometown]. Um … because I've got no friends, because I just left them … they're all in the same place and that doing the same thing … that's not for me anymore* (S Landale & Roderick, 2013).

In terms of identity shifts, findings conflicted. Some felt that taking part in interventions specifically aimed at promoting recovery meant that participants remained labelled as a 'substance user' and therefore connected with a label they no longer wanted to acknowledge post cessation (Sari et al., 2017), whilst others felt that an emphasis on sport facilitated them in moving toward a more positive identity regardless of the context (Landale, 2012):

> *In my addiction it was just about self, it was just about me, you wouldn't think about the impact and then getting accepted into my own community – all I have ever put in was negative, with drug dealing and that, but to be accepted by my community and be putting something in that was positive, that was a big thing for me* (Morton et al., 2016).

5.2.4. Reduced AOD use through improved mood, perceived quality of life, empowerment and confidence

Involvement in PA was also talked of in terms of providing structure to lives that were often described as difficult, complex and chaotic. PA appears to operate in a way that provides an alternative focus or escapism in the form of relaxation. The discipline involved in PA was also spoken about in terms of improved mood and perceived quality of life, with participants increasing in confidence that they were better equipped to cope, which in turn reinforced their ability to stop AOD use, resulting in a greater sense of control. PA provided a coping strategy for managing difficult emotions (Abrantes et al., 2017; Landale & Roderick, 2013; Malloch, 2011; Neale et al., 2012; Nguyen et al., 2017): one example citing how this was attributable to the discipline of the exercise classes as well as exercise itself (Morton et al., 2016). Others talked of how PA helped them cope with moving from a state of chaos to one of control, whilst others spoke of increases in self-esteem and confidence (Beynon et al., 2013; Curran et al., 2016; Gimenez-Meseguer et al., 2015; Morton et al., 2016; Roessler, 2010; Van Hout & Phelan, 2014):

> *Exercise has made me excel myself, at a cognitive and mental level too. What Jorge (the instructor) has encouraged us to do has been to feel a little bit better about ourselves every day* (Gimenez-Meseguer et al., 2015).

Skill acquisition through taking part in PA also appears to boost self-efficacy and self-esteem (Van Hout & Phelan, 2014) through an increased sense of competence as well as installing a sense of self-discipline (Peterson & Johnstone, 1995). Some spoke of this self-discipline directly in terms of changes in how they relate to others (Landale, 2012; Landale & Roderick, 2013; Van Hout & Phelan, 2014):

> *The discipline that the sport teaches you like, it teaches you how to be much more mannerly and how to talk to people better without you even realizing it* (Van Hout & Phelan, 2014).

5.3. In what way(s) does the frequency, intensity, duration, type and timing of PA impact AOD use?

5.3.1. Duration/timing/frequency

Reported evidence for optimal duration or timing of interventions was scarce. In one study participants felt that the intervention was too short (9 sessions over 6 weeks) (Ussher et al., 2000), whilst participants in another study perceived the intervention as too irregular to impact on their ability to reduce consumption (Landale & Roderick, 2013). In relation to timing of interventions, one participant felt that other pressures prevented them from involving themselves fully:

> *I'd like to do the course again and do it properly* (Ussher et al., 2000).

Heavy drug use also posed a significant barrier to commitment to PA, particularly at the beginning of interventions and in relation to sustained and regular engagement (Landale & Roderick, 2013; Van Hout & Phelan, 2014). This appears to be because use/relapse reduces motivation and energy, re-establishes previous social circles and restores the sourcing of substances as the primary activity:

> *When you are drinking and taking coke [cocaine] or whatever like, you wake up the next day and you are not even thinking about any football or nothing. All you are thinking about, is someone texting you [SMS text on cell phone] to go out like and start off the same craic [irish for rigmarole] again. You end up getting arrested or something serious happening to you [sigh]. You regret those things but that is what happens* (Van Hout & Phelan, 2014).

However, some participants found that as drug taking decreased due to accessing services, PA levels increased:

> *I just get up, have a fag, a cup of tea and I get on to doing something straight away, like me weights, or anything really …* (Neale et al., 2012).

Another study identified two instructors who did not feel that their clients were ready to engage in PA and suggested better screening to identify why this might be (Beynon et al., 2013).

5.3.2. Type & intensity

Findings suggest that the importance of type and intensity of PA varies according to individual preference and perceived ability to take part. Various activities (type and intensity) were spoken of in terms of barriers (Butzer, LoRusso, Windsor, et al., 2017; Linke et al., 2019; Muller & Clausen, 2015; Nguyen et al., 2017; Sari et al., 2017), whilst having a wide variety of activities was viewed as a way of overcoming barriers associated with a specific type and intensity of activity. A variety of activities was a way of engaging people and maintaining interest, both in terms of trying a new form of PA and in rediscovering a previously held interest (Beynon et al., 2013; Muller & Clausen, 2015; Neale et al., 2012; Sari et al., 2017; Ussher et al., 2000; Van Hout & Phelan, 2014).

Studies reporting levels of PA post intervention identified a range of influencing factors. Lack of service support/motivation was cited as one reason for reduced PA post-intervention (Beynon et al., 2013; Ussher et al., 2000), as was missing the organised nature of group activities (Roessler, 2010). Additionally, experienced exercisers were more likely to continue exercising alone after dropping out of interventions than those who were inexperienced (Sari et al., 2017).

Finally, one study identified participants were dissuaded by pre-conceived ideas concerning one type of PA (yoga) but preconceptions changed once they experienced it and understood what was actually involved (Smoyer, 2016).

5.4. What are the reported barriers and facilitators to taking part in PA?

5.4.1. Health and fitness

A lack of physical fitness was presented by some as a barrier to taking part in PA, with some citing being overweight, lacking balance (Neale et al., 2012; Nguyen et al., 2017) or having underlying medical conditions which prevented participation (Beynon et al., 2013; Neale et al., 2012; Nguyen et al., 2017; Sari et al., 2017).

5.4.2. Access and affordability

Provision of local and affordable exercise facilities served as an

effective engagement strategy for PA, whilst also acting as a strategy to encourage engagement with lifestyle and substance use support services (Landale, 2012). However, when people lost contact with support services providing access to facilities, attending became logistically or financially difficult (Curran et al., 2016; Malloch, 2011; Neale et al., 2012):

> *I can't afford the bus fare. I want to come like, but just can't always get up there* (Malloch, 2011).

Others explained that in some cases exercise was discouraged in treatment (residential) settings as it was felt to distract from the therapeutic process. However, participants who were keen to be active found alternative approaches:

> *We're not allowed to do physical exercise [in residential rehabilitation service], but what we do in our room is we do press ups and sit ups …* (Neale et al., 2012).

5.4.3. Lifestyle and motivation

For those with complex social needs (e.g. people who were homeless), day-to-day demands and complexities prevented them from attending the intervention (Malloch, 2011). Others cited caring responsibilities as making attendance at interventions prohibitive, as well as other commitments such as work, college and friends (Neale et al., 2012). However, it is important to note that some participants cited that engaging in PA offered a positive distraction and focus away from other daily, and sometimes challenging, activities (Smoyer, 2016).

Lack of motivation was cited by some as a barrier (Beynon et al., 2013; Neale et al., 2012; Ussher et al., 2000; Van Hout & Phelan, 2014). In some cases this was linked to AOD use, but was generally attributed to low levels of fitness and difficulty in attendance/adopting PA behaviours outside of the intervention.

5.4.4. Intimidating environment and the perceptions of others

Three studies reported participants finding the exercise environment intimidating. All referred to gym-based interventions specifically (Morton et al., 2016; Neale et al., 2012; Nguyen et al., 2017). These were related to concerns over the perceptions of others and feeling the need to explain their physical condition (both in terms of weight and strength) as a result of their AOD use.

Concerns over others' perceptions and judgements were linked in part to the PA environment, whilst for others it was more psychological and independent of the environment. Participants talked of concerns about other people's perceptions of them, both in terms of physical ability and appearance (Beynon et al., 2013; Neale et al., 2012; Sari et al., 2017). This may be a particular concern for those who had been previously fit and active (Sari et al., 2017):

> Cos *I'm so skinny and that after smoking crack. I don't like to go to the gym in my vest* (Neale et al., 2012).

5.5. How much support and in what mode of delivery best sustains an increase in PA in order to limit AOD use?

5.5.1. Social support for engaging in, and sustaining, PA

Individuals engaging in SUD treatment report differing requirements of the social element, which is reflected in a disparity in preference over group or individual activity. The provision of group PA was reported as appealing to many participants (Muller & Clausen, 2015; Peterson & Johnstone, 1995; Roessler, 2010; Sari et al., 2017), and may help in sustaining levels of PA post-intervention (Roessler, 2010). Inexperienced exercisers stated that group exercising was a facilitator, both in terms of initiating and sustaining engagement. Groups or the presence of a 'contact person' helped provide a sense of accountability and encouragement, and the perception that others in the group were similarly matched in terms of experience and fitness levels meant that participants felt more comfortable (Muller & Clausen, 2015; Peterson & Johnstone, 1995; Sari et al., 2017). However, one study reported that whilst participants enjoyed the social aspect of the intervention, some preferred solitary activities where they could compete against themselves:

> *I do a lot of running on me own. I wouldn't really do running with people. I'd rather run on me own, cause I don't like to talk. Like I would rather have the music on my ears, and do my own thing* (Van Hout & Phelan, 2014).

Whether a group approach is preferred may also be influenced by the amount of time spent in the intervention and/or stage of recovery. One study found that as participants progressed through the intervention promoting PA, they were more likely to exercise alone or with friends (Neale et al., 2012). Furthermore, the same study found that women were more likely than men to prefer group based PA, possibly because of the type of activity favoured (e.g. exercise classes vs. running).

5.5.2. Social support and new friendships

Participants predominantly placed positive value on the social element of interventions, both in terms of peers and staff (Beynon et al., 2013; Curran et al., 2016; Ussher et al., 2000). Relationships that developed were talked of in terms of trust (Gimenez-Meseguer et al., 2015), camaraderie (Malloch, 2011; Peterson & Johnstone, 1995; Van Hout & Phelan, 2014) and as an important element of moving on from substance use and developing new social relationships to combat the associated isolation (Curran et al., 2016; S. A.; Landale, 2012; Landale & Roderick, 2013; Malloch, 2011; Neale et al., 2012; Roessler, 2010):

> *And like the ones from [area] I've been getting to know them … it's a good bunch of lads here. I like coming here, because I dinnit associate with anybody in [hometown]. Um … because I've got no friends, because I just left them … they're all in the same place and that doing the same thing … that's not for me anymore*(Landale & Roderick, 2013).

5.5.3. Environmental (programme structure)

The support, encouragement and guidance provided by staff was highly valued across a number of study findings. Specific aspects included guided sessions (Linke et al., 2019; Muller & Clausen, 2015; Ussher et al., 2000), but most comments centred on the psychological benefits this relationship provided. Motivation, empathy, style of communication and support were all part of a bond valued by the participants (Landale, 2012; Landale & Roderick, 2013; Smoyer, 2016; Van Hout & Phelan, 2014):

> *The trainer the way he talked to us, telling us that we are good, getting that little bit of motivation. It was powerful* (Van Hout & Phelan, 2014).

Additional motivational factors that were appreciated by participants included use of a Fitbit.

(Abrantes et al., 2017; Linke et al., 2019), SMS session reminders (Muller & Clausen, 2015), and the provision of home exercise sheets (Ussher et al., 2000).

Multi-component interventions involving some form of education appear to encourage motivation for change. Examples identified in the data include exercise counselling, discussion/advice (Peterson & Johnstone, 1995; Ussher et al., 2000), educational/employment training (Landale & Roderick, 2013; Morton et al., 2016), and guidance with emotional/psychological needs (Landale, 2012; Malloch, 2011; Peterson & Johnstone, 1995):

> *I love the bonding that we get camping; I love the bonding that we get going up hills, doing all the half marathons, doing the 10ks; I love the bonding with setting up the music workshop and playing the guitars and the instruments together. But this (the recovery meeting) is probably the most*

important part for me, somewhere I can get the madness out of my head and there is somebody there to listen, you know (Malloch, 2011)?

6. Discussion

This is the first qualitative synthesis of acceptability, feasibility, barriers, facilitators and perceived utility of PA as an adjunct to treatment for substance use disorders.

The findings draw together the available evidence and experience of service users involved in interventions using PA to assist in reducing or stopping AOD use. Grouping the complex and inter-connected themes to reflect the research aims allows the data to contribute to the development of a cohesive model of how PA can be integrated within SUD programmes, and where gaps in our understanding remain.

The mechanisms by which PA supports abstinence and encourages motivation for recovery are complex and operate at biological and psycho-social levels. As fitness increases, changes in bodily awareness appear to be absorbed into the development of a new, healthy identity which is incompatible with AOD use (Bathish et al., 2017; Dingle, Cruwys, & Frings, 2015). Indeed, for participants who described themselves as having an 'addictive mind', the 'high' that was experienced through activity appears to offer an acceptable replacement for substance use. The formation of new habits and the breaking of bonds with old practices may be facilitated by engagement in new routines and social interactions, but this is reliant on access to activities that embody an alternative way of being connected to the new identity through positive, non alcohol or substance use based, reinforcement. PA may assist in this transference through the provision of an alternative focus to support the process of change.

Evidence from this review suggests that participants value and engage with activities that are tailored to them personally and their stage of recovery or level of use, rather than those prescribed (Beynon et al., 2013; Gimenez-Meseguer et al., 2015; Nguyen et al., 2017; Smoyer, 2016; Ussher et al., 2000). Tailoring interventions is very likely to be key to supporting recovery. Although it is unclear as to whether being overweight/unfit poses a physical or mental barrier, inexperienced exercisers reported feeling intimidated by certain environments and exercise types, and future intervention design therefore needs to consider how best to overcome this. Findings presented here suggest (1) offering a choice of exercise types and (2) providing group sessions/peer support based on individual preference and ability, and there seems no reason to believe that conventional evidence-based, theory driven components to promote physical activity in the general population shouldn't also be embedded in interventions (Murray et al., 2017).

The mechanisms by which PA is used to engage participants appear to vary according to stage of substance use or stage of recovery. Findings suggest that the design of the programme is most successful when comprising educational or training opportunities and a motivational element (Abrantes et al., 2017; Landale, 2012; Landale & Roderick, 2014; Malloch, 2011; Morton et al., 2016; Peterson & Johnstone, 1995; Ussher et al., 2000). A key component to the initial engagement with this population appears to be directly related to building confidence and this seems particularly pertinent to inexperienced exercisers who expressed concerns about their ability. As such, tailoring of support to encompass fitness levels and underlying medical conditions (Beynon et al., 2013; Neale et al., 2012; Nguyen et al., 2017; Sari et al., 2017), combined with ensuring that facilities are accessible and affordable, all appear to facilitate engagement (Curran et al., 2016; Landale, 2012; Neale et al., 2012).

There were insufficient data available to support any recommendations for frequency of PA interventions. No evidence was identified to help understand how often PA needs to be engaged with to influence AOD use. However, there is some evidence to support the argument that provision of PA opportunities needs to be flexible and regular enough to allow continued engagement. Identified mechanisms suggest that the social aspect of interventions are key. If interventions are too infrequent, this may deter engagement and the forming of these bonds.

In terms of intensity, participants were most positive when activity intensity was matched to their perceptions of what was achievable. Concerns expressed over fitness levels and underlying medical conditions support the argument for a person-centred approach.

The optimal length of intervention and support needs further research. Participants talked about how PA, whilst valued, decreased once the intervention ceased. Services should consider how best to support and enable participants to continue their engagement with PA longer term, whether practically (e.g., access, financial cost of services, in consideration of lifestyle) or motivationally.

Thought also needs to be given to the timing of the intervention. People in the early stages of recovery may have other, more immediate concerns (e.g. physical withdrawal and other health and social care needs (Maslow, 1943)) to meaningfully engage, so PA may be more effective if introduced later on in recovery. That said, raising awareness and prompting individuals to consider physical activity for self-regulation may be useful at some later time, as part of natural recovery (King & Tucker, 2000), especially for those who have previously been physically active. Natural recovery and concurrent exercise behavior change was not explored within this review, as the review aimed to understand PA intervention components and mechanisms to aid in the designing of PA interventions and future research. However, natural recovery and 'self-change' do occur over time (King & Tucker, 2000) resulting in increased PA levels, and whilst this did not emerge as a theme within the current review, the bi-directionality of this relationship should be considered when designing interventions and future work.

6.1. Implications for future research and intervention design

The findings presented in this paper identify a number of barriers and facilitators pertinent to intervention design, particularly in relation to how they can be best designed to support, encourage and maintain motivation for sustained recovery. Given that the value of an intervention relies on the degree to which it can engage participants, it may be that offering choice and tailoring support to an individual's abilities, preferences and beliefs related to the benefits of PA is paramount to successful design. Barriers evidenced here mainly relate to regimented design elements that impose expectations and demands on individuals that deter engagement, whilst PA interventions which were well received tailored type and dose. Identified mechanisms corroborate these findings; both engagement and participant experience are improved when interventions allow participants to control their participation. As such, a person-centred approach that is flexible and adaptive to varying levels of fitness appears best placed to engage participants. Maximising motivation also needs to be considered; for those interventions using a group approach this appears to be best achieved through staff and peer support within a multi-component framework (incorporating educational and/or other therapeutic input). For those exercising individually (or where interventions aim to encourage PA outside of intervention attendance), tools for promoting self-monitoring such as a 'fitbit' may help increase and maintain activity levels.

Evidence remains scarce, however, particularly in relation to the optimal time to introduce PA into treatment, the most effective dose, and the most beneficial mode of delivery. Understanding how PA influences substance use is paramount to future intervention design. If PA moderates substance use then intervention outcomes may be optimised by early introduction within treatment if acceptable to the individual. This may enable a bi-directional interaction: decreased AOD use allowing for an increase in PA, which then further facilitates and embeds behavior change. Further research is needed in several areas, including; identifying whether 1-2-1 or group support is preferable, or whether this is dependent on stage of recovery, previous experience and/or individual preference; the optimal environment for the delivery of such

interventions; the impact of gender on intervention design and outcome. No evidence was identified for whether exercising in nature had an impact on mental wellbeing despite this being evidenced in other population groups or whether this, in turn, influences recovery.

In summary, PA offers an acceptable adjunct to traditional approaches for the treatment of substance use disorders from early engagement in treatment through to continued support for behavior change and sustained recovery. However, further research is needed to identify the optimal design, timing, frequency and dose of PA to best support the effectiveness of interventions and how to match the intensity and timing of support to the individual's needs.

Declaration of competing interest

JN has received, through her University, research funding from Mundipharma Research Ltd and Camurus AB to study novel opioid pharmacotherapy delivery systems and nasal naloxone.

All other authors declare no conflicts of interest.

Acknowledgements

This paper presents independent research funded by the NIHR under its Research for Patient Benefit (RfPB) Programme (Grant Reference Number PB-PG-0215-36117). The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health & Social Care.

This report is independent research supported by the National Institute for Health Research Applied Research Collaboration South West Peninsula. The views expressed in this publication are those of the authors and not necessarily those of the National Institute for Health Research or the Department of Health and Social Care.

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